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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Eric C. Beck

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LUCENT TECHNOLOGIES INC.

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EXAMINER

MURPHY, RHONDA L

ART UNIT

PAPER NUMBER

2667

DATE MAILED: 10/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/772,359	Applicant(s) ^{OK} BECK ET AL.	
	Examiner Rhonda L. Murphy	Art Unit 2667	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 January 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4/16/02</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character “531” has been used to designate both transmitter and receiver in Figure 5. According to the specification, the receiver shall be designated as “533”. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled “Replacement Sheet” in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The attempt to incorporate subject matter into this application by reference to co-pending application number 09/648,983 is improper because examiner believes essential subject matter has not been fully disclosed in the instant application. The development of orthogonal sequences of arbitrary length as a function of first and second existing orthogonal sequences shall be fully disclosed in the instant application.

3. The disclosure is objected to because of the following informalities: The receiver “131” on page 7, line 8, shall be changed to “133”. Element “503” on page 8, line 19,

shall be designated as “**523**”; and source “**101**” and modulator “**103**” on page 8, line 21, shall be designated as “**501**” and “**503**” respectively.

Appropriate correction is required.

Claim Objections

4. Claims 5,8,25 and 34 are objected to because of the following informalities: The word “**store**” shall be changed to “**source**” on line 2 of claim 5, line 10 of claim 25 and line 13 of claim 34. Claim 8 is missing a period and “is a” is duplicated and shall be deleted. Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 uses the expression “**of a type**”, which is unclear and indefinite.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-10,15,24,25,33,37 and 38 are rejected under 35 U.S.C. 102(e) as being anticipated by Suzuki (US 6,483,866).

Regarding claims 1,5,10,15,24 and 33, Suzuki teaches a system for use in performing channel sounding, comprising: a transmitter (Fig. 2, element **BS1**), said transmitter including a source of an orthogonal sequence which is repeatedly supplied as an output (Fig. 2, elements **RG1** and **FR1** combined; col. 4, lines 32-36), said orthogonal sequence having been developed as a function of first and second existing orthogonal sequences and having a perfectly white spectrum should it be repeated an infinite number of times (Fig. 2, elements **T1** and **T2**; col. 3, lines 45-53; col. 4, lines 22-32); a modulator for modulating a carrier signal by said orthogonal sequence (col. 4, lines 59-63; modulator located within element **TR1** of Fig. 2), said modulator being coupled to said source (Fig. 2, source is depicted as elements **RG1** and **FR1** combined, and is coupled to **TR1** – which comprises a modulator); whereby no channel filtering is required between said source and said modulator to reduce out-of-band emissions caused by said source (Fig. 2, col. 4, lines 59-63, no filtering occurs between the source and modulator); and a receiver (all elements of Fig. 5) including a demodulator (located within element **19R** of Fig. 5), for demodulating a received modulated version of said orthogonal sequence that modulates a carrier (col. 5, lines 5-10) and which is repeated at least once (it is known in the art that an orthogonal sequence is repeated) was

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transmitted by said transmitter (col. 4, lines 59-63); a finite impulse response (FIR) filter implementing a least squares algorithm for developing an estimate of the channel characteristic (Fig. 5, element **20**, also shown in detail in Fig. 6A, col. 5, lines 64-67, col. 6, lines 1-27) , said FIR filter being coupled to receive said demodulated orthogonal sequence from said demodulator (Fig. 5, element **19R** contains demodulator coupled to FIR filter - element **20**); whereby no channel filtering is performed between said demodulator and said FIR filter to reduce out-of-band noise inherently resulting from said orthogonal sequence prior to its being supplied to said modulator (Fig. 5, no filtering is performed between the demodulator and FIR filter).

Regarding claims 2 and 3, Suzuki further teaches a source of an orthogonal sequence being a memory, which stores said orthogonal sequence (col. 4, lines 27-32, **held in register RG1**) and a sequence generator (col. 4, lines 24-32).

Regarding claim 4, Suzuki further teaches an antenna coupled to the modulator for broadcasting said modulated signal (Fig. 2, antenna **ANT-T1** is coupled to modulator located within element **TR1**).

Regarding claims 6,25,37 and 38, Suzuki teaches a transmitter and method for use in performing channel sounding, comprising the steps of: repeatedly supplying a plurality of orthogonal sequences that is a function of first and second existing orthogonal sequences and has a perfectly white spectrum should it be repeated an infinite number of times (col. 3, lines 45-53; col. 4, lines 22-32); modulating each of a plurality of identical carrier signals by a respective one of said plurality orthogonal sequences (col. 4, lines 59-63), said means for modulating being coupled to said means for repeatedly

supplying (Fig. 2, modulator coupled to source); whereby no channel filtering to reduce out-of-band emissions is performed on any of said plurality of orthogonal sequences between said source and said modulator (Fig. 2); and recording and playing back said modulated carrier signal (it is known in the art that a modulated carrier signal may be recorded and played back).

Regarding claims 7 and 8, Suzuki further teaches a means for repeatedly supplying as a memory, which stores said orthogonal sequence (col. 4, lines 27-32, **held in register RG1**) and as a sequence generator (col. 4, lines 24-32).

Regarding claim 9, Suzuki further teaches means for broadcasting said modulated signal (Fig. 2, antenna **ANT-T1**).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Kroeger (US 2003/0137928).

Regarding claim 11, Suzuki teaches an orthogonal sequence in an FIR filter (col. 5, lines 64-67, col. 6, lines 1-27).

Suzuki fails to teach FIR filter coefficients as complex conjugate values.

However, Kroeger teaches complex conjugate values (paragraph 55).

In view of this, having the system of Suzuki and then given the teaching of Kroeger, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by utilizing complex conjugate values so as to smooth the resulting symbols over time (paragraph 55).

11. Claims 12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Bar-David et al (US 5,623,511).

Regarding claims 12 and 17, Suzuki teaches a plurality of channel estimates produced by said FIR filter (col. 6, lines 6-10).

Suzuki fails to teach an averager for averaging the channel estimates.

However, Bar-David teaches an averager for averaging a plurality of channel estimates (col. 15, lines 25-30).

In view of this, having the system of Suzuki and then given the teaching of Bar-David, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by including an averager so as to obtain a more accurate channel estimate.

12. Claims 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Butler (US 6,771,620).

Regarding claims 13 and 16, Suzuki teaches a demodulated training sequence being received by said FIR filter, and there being no band-limiting filter in said transmitter (Fig. 5, element 20, also shown in detail in Fig. 6A, col. 5, lines 64-67, col. 6, lines 1-27).

Suzuki fails to teach using a band-limiting filter to eliminate out of band noise picked up at said receiver.

Butler teaches using a baseband filter to eliminate out of band noise picked up at said receiver (col. 13, lines 28-36).

In view of this, having the system of Suzuki and then given the teaching of Butler, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by including a band-limiting filter so as to allow a certain range of frequencies to pass, thus providing a smoother signal with minimal noise.

13. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Shattil (US 2004/0100897).

Regarding claim 14, Suzuki teaches means for receiving a wireless broadcast version of said modulated version of an orthogonal sequence (col. 5, lines 5-8).

Suzuki fails to teach converting it into an electrical representation.

However, Shattil teaches converting the orthogonal sequence into an electrical representation (paragraph 72, page 6).

In view of this, having the system of Suzuki and then given the teaching of Shattil, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by converting the orthogonal sequence into an electrical form, so as to reduce signal fading and interference (paragraph 5, page 1).

14. Claims 18,21,26,29,30,34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Wallace (US 6,473,467).

Regarding claims 18, 29 and 34, Suzuki teaches a system for use in performing channel sounding, comprising: a transmitter and receiver (Fig. 2 element **BS1** and Fig. 5 all elements), said transmitter including a supplier of a plurality of orthogonal sequences each of which is a version of an original orthogonal sequence (Fig. 2, elements **RG1** and **FR1** combined; col. 4, lines 32-36), each of said plurality of orthogonal sequences being repeatedly supplied (co. 4, lines 32-36), said original orthogonal sequence having been developed as a function of first and second existing base orthogonal sequences and having a perfectly white spectrum should it be repeated an infinite number of times (Fig. 2, elements **T1** and **T2**; col. 3, lines 45-53; col. 4, lines 22-32). Suzuki also teaches a modulator for modulating a carrier signal by said orthogonal sequence (col. 4, lines 59-63; modulator located within element **TR1** of Fig. 2), said modulator being coupled to said source (Fig. 2, source is depicted as elements **RG1** and **FR1** combined, and is coupled to **TR1** – which comprises a modulator); a demodulator (located within element **19R** of Fig. 5), for demodulating a received modulated version of said original orthogonal sequence that modulates a carrier (col. 5, lines 5-10); a finite impulse response (FIR) filter implementing a least squares algorithm to produce a plurality of channel estimates, one for original orthogonal sequence (Fig. 5, element **20**, also shown in detail in Fig. 6A, col. 5, lines 64-67, col. 6, lines 1-27), said FIR filter being coupled to receive said demodulated orthogonal sequence from said

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demodulator (Fig. 5, element **19R** contains demodulator coupled to FIR filter - element **20**); without any channel filtering to reduce out-of-band emissions inherently resulting from said versions of said original orthogonal sequence that modulated said carrier to ultimately become said received versions after passing through a channel and being received being performed between said demodulator and said respective associated FIR filter. (Fig. 5, no filtering is performed between the demodulator and FIR filter).

Suzuki fails to teach a plurality of modulators, demodulators and FIR filters.

However, Wallace teaches a plurality of modulators (Fig. 1A, elements **116A – 116T**) for producing a plurality of modulated signals by modulating a carrier signal by said each of said plurality of orthogonal sequences (Fig. 1A, col. 3, lines 55-67), and a plurality of demodulators (Fig. 1A, elements **124A – 124R**), each of said demodulators demodulating a respective plurality of received versions of said original orthogonal sequence that each modulates said carrier (col. 4, lines 10-13; orthogonal sequence represented by OFDM – orthogonal frequency division multiplexing, col. 2, lines 50-51);

It is known in the art that a plurality of FIR filters are used for each received version of the orthogonal sequence and coupled to receive its respective plurality of demodulated orthogonal sequences from a respective one of said demodulators.

In view of this, having the system of Suzuki and then given the teaching of Wallace, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by incorporating a plurality of modulators, demodulators and FIR filters, in order to accommodate the growing

demand for wireless communication, increase spectral efficiency, improve performance and enhance flexibility (col. 3, lines 38-40).

Regarding claims 21,26,30 and 35, Suzuki teaches a plurality means for broadcasting said modulated signal (Fig. 2) and an output by FIR filter (Fig. 5, output from element 20).

Suzuki fails to teach a plurality of means for broadcasting being coupled to a respective one of said means for modulating and a demultiplexer for separating out each channel estimate supplied as an output by the one of said FIR filters to which said demultiplexer is coupled.

However, Wallace teaches a plurality of means for broadcasting being coupled to a respective one of said means for modulating. (Fig. 1A) and a demultiplexer for separating out each channel estimate supplied as an output (col. 9, lines 32-33).

In view of this, having the system of Suzuki and then given the teaching of Wallace, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by including a demultiplexer and a plurality of broadcasting means connected to modulators, in order to accommodate the growing demand for wireless communication, increase spectral efficiency, improve performance and enhance flexibility (col. 3, lines 38-40). Additionally, it would have been obvious to include a plurality of demultiplexers for separating out each channel estimate supplied as an output by one of the FIR filters.

15. Claims 19,20,22,23,27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki and Wallace as applied to claims 18,29 and 34 above, and further in view of Lomp (US 6,272,168).

Regarding claims 19,20,22,23,27 and 28, Suzuki and Wallace teach a supplier of a plurality of orthogonal sequences comprising a source of said original orthogonal sequence (col. 4, lines 32-36).

Suzuki and Wallace fail to teach at least two delayed versions of said original orthogonal sequence; wherein the delay between each orthogonal sequence of said plurality of orthogonal sequences is substantially equal.

However, Lomp teaches at least two delayed versions (col. 10, lines 11-14, 35-43) of the sequence, wherein the delay between the plurality of sequences is substantially equal and not substantially equal (it is known in the art that delays between sequences are capable of variable lengths). It is also known in the art that said plurality of orthogonal sequences include at least said original orthogonal sequence and at least one delayed version of said original orthogonal sequence.

In view of this, having the system of Suzuki and Wallace and then given the teaching of Lomp, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki and Wallace, by incorporating delays between the sequences, in order to improve overall timing issues related to the plurality of sequences (col. 10, lines 40-42).

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16. Claims 31 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki and Wallace as applied to claims 29 and 34 above, and further in view of Butler (US 6,771,620).

Regarding claims 31 and 36, Suzuki and Wallace teach a plurality of demodulators and FIR filters for reducing out-of-band noise that was introduced into said baseband demodulated received orthogonal sequence through said channel or at said receiver.

Suzuki and Wallace fail to teach a bandlimiting filter.

However, Butler teaches a baseband filter coupled between at least one demodulator and FIR filters (Fig. 5, col. 13, lines 28-36).

In view of this, having the system of Suzuki and Wallace and then given the teaching of Butler, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki and Wallace, by including a band-limiting filter so as to allow a certain range of frequencies to pass, thus providing a smoother signal with minimal noise.

17. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki and Wallace as applied to claim 29 above, and further in view of Bar-David et al (US 5,623,511).

Regarding claim 32, Suzuki and Wallace teach a plurality of channel estimates produced by said FIR filter.

Suzuki and Wallace fail to teach an averager for averaging the channel estimates.

However, Bar-David teaches an averager for averaging a plurality of channel estimates (col. 15, lines 25-30).

In view of this, having the system of Suzuki and Wallace and then given the teaching of Bar-David, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki and Wallace, by including an averager so as to obtain a more accurate channel estimate.

Conclusion

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents are cited: System and Method For Providing an Accurate Estimation of Received Signal Interference For Use In Wireless Communications Systems, Sindhushayana et al, US 6,661,832; Channel Estimation For OFDM Systems With Transmitter Diversity, Ariyavisitakul et al, US 6,473,393; Channel Estimation For Communication Systems Using Weighted Estimates Based On Pilot Data and Information Data, Papasakellariou et al, US 6,700,919; and Method For Reverse Channel Sounding In a Communications System, Tan Boon et al, US 6,031,831.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda L Murphy whose telephone number is (571) 272-3185. The examiner can normally be reached on Monday - Friday 8:00 - 4:30pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Ngo can be reached on (571) 272-3139. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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